

Patent Claims

1. A method for (in particular performance-improving) emission of exhaust gases from internal combustion engines in marine vessels into the water surrounding the marine vessels, characterized in that the exhaust gases and a water flow which is taken from the surrounding water are mixed with one another in a reduced-pressure field, with the reduced pressure for the reduced-pressure field being produced by a reduction in the cross-sectional area of the water flow before mixing.
2. The method as claimed in claim 1, characterized in that the cross-sectional area is reduced in such a manner as to produce an accelerated water flow in the form of a hollow cylinder.
3. The method as claimed in claim 1 or 2, characterized in that the exhaust gases are introduced into the interior of the hollow-cylindrical water flow.
4. The method as claimed in claim 1, 2 or 3, characterized in that the exhaust gases are also passed to the outside of the hollow-cylindrical water flow.
5. The method as claimed in claim 1, 2, 3 or 4, characterized in that the hollow-cylindrical water flow is made to rotate, for example by means of swirl-producing means, such as blades.
6. The method as claimed in claim 1, 2, 3, 4, or 5, characterized in that the exhaust gas is caused to rotate in the opposite direction to the hollow-cylindrical water flow, for example by swirl-producing means, for example blades.

7. The method as claimed in one or more of the preceding claims,

characterized in that the exhaust-gas flow is caused to form a hollow-cylindrical shape, for example by means of a displacement body in the exhaust-gas flow.

8. The method as claimed in one or more of the preceding claims,

characterized in that the exhaust-gas flow is cooled, for example by means of water injection, in order to reduce its volume before being introduced into the reduced-pressure field.

9. The method as claimed in one or more of the preceding claims,

characterized in that the exhaust gas is subject to a pressure increase, for example in a widened exhaust-gas outlet pipe with a diffuser effect, after it has been mixed with the water flow and has passed through the reduced-pressure field.

10. A device for carrying out the method for emission of exhaust gases from internal combustion engines in submarines into the water surrounding the submarines, as claimed in one or more of the preceding claims,

characterized in that the device is in the form of an exhaust-gas/water mixer and has a reduced-pressure chamber.

11. The device for carrying out the method for emission of exhaust gases from internal combustion engines in surface vessels into the water in which the marine vessels are floating, as claimed in one or more of claims 1 to 9,

characterized in that the device is in the form of an exhaust-gas/water mixer and has a reduced-pressure chamber.

12. The device as claimed in claim 10 or 11,

characterized in that a guidance device for the mixing water is arranged upstream of the reduced-pressure chamber in the flow

direction and has an annular cross section so as to form a hollow-cylindrical waterjet.

13. The device as claimed in claim 10, 11 or 12, characterized in that a guidance device for the exhaust gas is arranged upstream of the reduced-pressure chamber in the flow direction and has an annular cross section, so that the exhaust gas flows out in the form of a hollow cylinder.

14. The device as claimed in claim 12, characterized in that the guidance device for the water has guidance elements, in particular guide vanes with a cycloid shape, which can cause the water to rotate.

15. The device as claimed in claim 13, characterized in that the guidance device for the exhaust-gas flow has guidance elements, in particular blades with a cycloid shape, by means of which the exhaust gas can be caused to carry out a rotating movement, in particular a rotating movement in the opposite direction to the water flow.

16. The device as claimed in one or more of claims 10 to 15, characterized in that the device has a radial pump for production of the water flow.

17. The device as claimed in one or more of claims 10 to 16, characterized in that the device has an axial pump for production of a waterjet.

18. The device as claimed in one or more of claims 10 to 17, characterized in that the device has a line for mixing the cooling water that is required by the internal combustion engine with the water flow in the device.

19. The device as claimed in one or more of claims 10 to 18, characterized in that the device has an inner displacement body for exhaust gas and water, which is arranged centrally in the device.

20. The device as claimed in one or more of claims 10 to 19, characterized in that the device has coaxial guidance tubes for the exhaust-gas flow and the water flow, with the exhaust gas being guided on the inside and the water on the outside.

21. The device as claimed in one or more of claims 10 to 20, characterized in that the device has a cooling device for the exhaust gas that is supplied.

22. The device as claimed in one or more of claims 10 to 21, characterized in that the device has shut-off means and a position-monitoring and control device for the supplied exhaust gas and the water, in particular with a monitoring and control device which is connected to a marine-vessel or engine control system.

23. The device as claimed in claim 22, characterized in that the monitoring device has a locking circuit for shutdown and a starting mode with regulated movement of the shut-off means.

24. The device as claimed in claim 22 or 23, characterized in that the device has non-return valves, in particular with position monitoring, for the exhaust-gas or water flows.

25. The exhaust-gas emission device as claimed in one or more of claims 10 or 12 to 24, characterized in that the device is used to increase the performance of

the boosted diesels for submarines when snorkeling.

26. The exhaust-gas emission device as claimed in one or more of claims 11 to 24, characterized in that the device is used to prevent exhaust-gas emission into the atmosphere for surface vessels, in particular for surface vessels with internal combustion engines distributed in the marine vessel.

27. The exhaust-gas emission device as claimed in claim 25, characterized in that the device is used at the stern of the marine vessel, in particular in the flow lee of the fin or of the fin base.

28. The exhaust-gas emission device as claimed in claim 25 or 27, characterized in that the device is used in the fin of the submarine.

29. The exhaust-gas emission device as claimed in claim 26, characterized in that the device is used for in each case one internal combustion engine, for example in each case one diesel engine, in different marine vessel safety areas of a naval vessel.

30. The exhaust-gas emission device as claimed in claim 26 or 29, characterized in that the device is used for surface vessels for emission of the other exhaust gases which are produced in the marine vessel, for example the exhaust air from the air-conditioning system, or for reformer exhaust gases from fuel-cell modules.

31. The exhaust-gas emission device as claimed in one or more of the preceding claims,

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characterized in that the device is used with an adjustable outlet-flow diffuser for matching the different exhaust-gas emission depths.